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<p>(54) Title: METHOD AND APPARATUS FOR MAKING A SECURITY CARD AND A SECURITY CARD MADE THEREBY</p> <p>(57) Abstract</p> <p>A security card is made by digitising and storing, e.g. in a T.V. framestore, a graphic image characteristic of the card-holder, e.g. a photograph. Alphanumeric data relating to the holder and the nature of the card is also stored. The graphic image is facsimile-printed on the card, with ink or toner, and the alphanumeric data is printed ordinarily, e.g. with a daisy-wheel printer. The card is preferably preprinted with a security design. The fully-printed card is encapsulated between thermoplastic layers of transparent film, which bond firmly to the ink/toner of the printed graphic image.</p>			
<pre> graph TD     12[T.V. CAMERA] --&gt; 13[VIDEO DIGITISER]     13 --&gt; 14[COMPUTING APPARATUS]     14 &lt;--&gt; 16[KEYBOARD]     14 &lt;--&gt; 19[ALPHANUMERIC PRINTER]     14 &lt;--&gt; 20[HIGH RES. MONITOR]     14 &lt;--&gt; 21[CONTROLLER]     14 &lt;--&gt; 22[FILM ENCAPSULATION]     14 &lt;--&gt; 23[MODEM]     14 --&gt; 15[DISC STORE]   </pre>			

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METHOD AND APPARATUS FOR  
MAKING A SECURITY CARD AND  
A SECURITY CARD MADE THEREBY

The present invention is concerned with a method and apparatus for making a security card and also a security card made by such method or apparatus. The invention is concerned with any form of security card such as used for 5 passports, identity documents, driving licences, and any other such document which has details relating to a particular individual person (a card-holder) and is potentially liable to forgery. Various forms of such security card already in use include a graphic image which is characteristic of the card-holder. Such a graphic image may be 10 in the form of a photograph of the holder or may be the holder's signature for example. Such security cards also normally include typed or printed information in the form of purely alphanumeric data usually relating to the holder 15 and the nature and/or usage of the card. A method

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proposed and in use hitherto for the production of such security cards employs photographic techniques for reproducing the graphic image, usually a photograph, of the holder on the card. Thus, photographic prints, usually 5 on photographic paper coated with a sensitised gel layer is used to provide the photographic image and this is affixed to a surface of the card. It is known also then to encapsulate the card with the photograph affixed between two layers of a transparent plastics film. This 10 film is typically formed of a two-layer laminate comprising a high melting point outer layer, usually of polyester, and a thermoplastic inner layer, e.g. of polyethylene. The card with photograph attached is bonded between the thermoplastic layers by heat-sealing so that 15 the thermoplastic layers are bonded together around the edges of the card and to the card surfaces. A problem with such security cards is that they are susceptible to forgery. The gel-coating of the photograph does not bond readily to the covering thermoplastics film so that the 20 thermoplastics film can be removed to expose the photograph which can then be altered or changed.

The present invention is concerned with providing a security card which is less susceptible to forgery and yet relatively simple to produce in large quantities.

25 In accordance with one aspect of the present

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invention, there is provided a method of making a security card bearing a graphic image which is characteristic of the card-holder together with alphanumeric data relating to the holder and the nature and/or usage of the card,

5 comprising applying said graphic image to said card by facsimile printing on to the card and applying said alphanumeric data to said card by printing in a predetermined type-face on to the card. The facsimile printing step envisaged above is one which reproduces the graphic image

10 on the card or any other substrate employing an ink or toner bonded to the card's surface. Existing facsimile printers are known which use electrostatic techniques to sensitise a substrate in a pattern corresponding to the intended graphic image to be formed on the substrate.

15 The substrate is electrostatically charged so that it can take up a toner substance in densities corresponding to the desired graphic image. With this technique full grey-scale reproduction can be provided. The toner is then bonded to the substrate usually by processing with heat.

20 A main advantage of using this process to apply a graphic image to a security card is that, when encapsulating the printed card between thermoplastic film as described above, the toner or ink used to produce the graphic printed image becomes firmly bonded to the

25 thermoplastics layer so that it cannot be physically



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separated as is the case with photographic techniques using sensitised photographic gel.

Various alphanumeric information to be provided on the security card can be printed using normal printing techniques, i.e. with a printer having a predetermined type-face.

Preferably, in making the security card, a sample reproduction, or an original of said graphic image is recorded and digitised for storage in a computer store, 10 said digitised signal being then fed to a facsimile printer for printing said image on the security card. A video camera can be used to record the image, the video signal from the camera being digitised for storage in a video frame store. Conveniently, also, the alphanumeric 15 data to be printed on the card may be keyed into a computer store in digital format for subsequent feeding to an on-line printer for printing on to said card.

Normally, the security card includes one or more security features. One such feature is that the card is 20 pre-printed with a security design before printing with the facsimile image and desired alphanumeric data. It has been found then that on encapsulating such a card with a pre-printed security design, between thermoplastic layers as mentioned above, the ink of the security design 25 also becomes firmly bonded to the thermoplastic layer.



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As a result, it becomes substantially impossible to tamper with the graphic image formed by facsimile printing without also destroying the security design pre-printed on the card. Even if the completed encapsulated card is split, 5 usually by splitting the paper substrate of the card, it is impossible to reach the toner or ink forming the graphic image from behind the thermoplastic overlay without first dissolving or penetrating the security printing. As a result, any tampering with the graphic image becomes 10 immediately apparent.

Furthermore, when the graphic image is digitised in a computer store, it is relatively straight-forward for a security over-print to be added digitally to the image in the computer store by the computer prior to facsimile 15 printing the over-printed image on the card. It can be seen then that the over-print is physically inseparable from the graphic image printed on the card.

According to a further aspect of the present invention, there is provided apparatus for making a security card 20 bearing a graphic image which is characteristic of the card-holder together with alphanumeric data relating to the holder and the nature and/or usage of the card, the apparatus comprising digital computer means including a computer store, means for supplying digital data defining 25 said graphic image to the computer for storage, means for

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supplying digital data defining said alphanumeric data to the computer for storage, a facsimile printer responsive to said image defining data from the computer to print said image on to said card, and an on-line printer having a pre-  
5 determined type-face responsive to said alphanumeric defining digital data from the computer to print said alphanumeric data on the same card.

The apparatus conveniently includes a video camera and means for digitising the video signal therefrom for  
10 feeding to the computer means. The video camera can then be used to load the computer with the desired graphic image.

Normally the apparatus includes an encapsulating and sealing machine for encapsulating and sealing the fully-  
15 printed security card between thermoplastic transparent layers of film and bonding the film to the ink or toner layer of the facsimile printed image and any other ink-printed layers on the card.

The present invention still further envisages a  
20 security card comprising a card base having a graphic image facsimile printed thereon which is characteristic of the card-holder and also alphanumeric data printed thereon in a predetermined type-face, said alphanumeric data relating to the holder and the nature and/or usage  
25 of the card. Normally the card has one or more security



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features such as a pre-printed security design. Other security features envisaged include a micro-tint background on the card base, an ultraviolet responsive design provided on the card, a watermark in the paper of the card 5 base, or substances in the card which are sensitive to various reagents used by forgers.

The completed card usually includes layers of thermoplastic transparent film between which the fully-printed card is encapsulated and heat-sealed. Normally 10 the film is a laminate comprising an inner polyethylene layer and an outer polyester layer.

Examples of the present invention will now be described with reference to the accompanying drawings in which :

15 FIGURE 1 is a block schematic diagram illustrating an example of apparatus for making security cards and embodying the present invention;

FIGURES 2 and 3 are cross-sectional views, much enlarged, of two embodiments of security card embodying 20 the invention; and

FIGURE 4 is a plan view of a typical security card embodying the invention.

The examples of the invention to be described are particularly concerned with the preparation of the security 25 page of a typical passport, i.e. the page carrying the



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photograph, signature and vital statistics of the passport holder together with various other information relating to the passport. FIGURE 4 illustrates the lay-out of a complete passport page of the kind which may be made by 5 this example of the invention.

Referring to FIGURE 1, an ordinary photograph of the passport holder is provided in the usual way and when the passport page constituting the security card is to be produced, the photograph, referenced 10, is first located 10 on a mount 11 so as to be viewed by a T.V. camera 12. Commonly, a sample signature of the passport holder is also provided and located next to the photograph on the mount 11 to be viewed simultaneously by the camera 12. The video signal from the camera, which represents the photographic 15 image (and usually the signature) of the holder, is fed from the camera to a video digitiser 13 where the normal video signal is converted into digital form for feeding to computing apparatus 14. The computing apparatus is arranged to provide a video framestore which can store the 20 digital data representing one complete frame of video from the T.V. camera 12. The framestore may be embodied as part of a disc store 15 illustrated in FIGURE 1.

It will be appreciated that the single frame of video from the T.V. camera may be relatively subject to noise and 25 thus desirably a plurality of successive frames of the same



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image are processed to provide in the framestore a digital representation of the image with a reduced noise level. Apparatus and techniques for performing the above-mentioned functions are well-established and suitable computing 5 apparatus for the purpose is available from a number of manufacturers, including Comtal.

Alphanumeric data relating to the holder of the passport and also specific to the passport itself is also entered into the store of the computing apparatus by means 10 of a keyboard 16 associated with a display 17. The display 17 may be simply an alphanumeric display enabling the alphanumeric data being entered by the keyboard 16 to be monitored and corrected as necessary during entry. Thus an operator can enter via the keyboard 16 the vital statistics of the 15 passport holder as required for printing on the passport. The computing apparatus 14 may be pre-programmed to respond to shortened code words for various items of the alphanumeric data, such as town names in addresses. Once the graphic image and the alphanumeric data associated with the part- 20 icular passport has been entered in the store of the computing apparatus, the apparatus is ready to print the image and the data on the appropriate page. Digital data defining the graphic image and the alphanumeric data is supplied by the computing apparatus to an on-line graphic 25 printer 18 and also an on-line alphanumeric printer 19.

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The card base which is to be printed with this information is fed first to the graphic printer 18 for printing thereon the graphic image, and subsequently to the printer 19 for printing thereon the various relevant alphanumeric data.

5 In a convenient embodiment, several passport pages are produced in succession on successive card bases fed in a continuous web first to the graphic printer 18 and then automatically to the alphanumeric printer 19.

Very conveniently, the computing apparatus 14 may be  
10 able to organise the digital data defining the graphic image to be printed so as to locate the image as desired when printed on the security card by the printer 18.

Similarly, the positioning of the various items of alphanumeric data on the card by the alphanumeric printer 19  
15 may also be arranged via the computing apparatus 14.

Conveniently, this facility is under the control of an operator and there may be provided a further high-resolution T.V. monitor 20 with a controller 21, both linked to the computing apparatus 14. The high-resolution T.V.  
20 monitor is arranged to display the graphic image held in the framestore of the computing apparatus and the location of the image relative to a security card can then be adjusted by keying on the controller 21. For example, if the graphic image includes both a photograph and a sample  
25 signature of the card-holder, these two elements of the



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image may be separated electronically in the computing apparatus so as to be printed by the printer 18 at different places on the card. At the same time, the location of the various items of alphanumeric data can 5 also be controlled and adjusted as desired.

Still further, the computing apparatus may be arranged to process the graphic image data in various ways. For example, enhancement of the image may be provided to improve contrast or even focus. Established mathematical techniques 10 are known and available for processing digitally-stored images in this way. Also, the graphic image in the frame-store may be digitally overwritten with a desired security pattern so that the graphic image supplied to the printer 18 is a mixed signal containing both the graphic information 15 and the security over-print.

It will be appreciated that the monitor 17 and keyboard 16 may provide a dual function of monitoring the alphanumeric data as entered, as well as enabling monitoring of the graphic image to be printed and controlling the 20 composition of the card. In this case, the separate high-resolution T.V. monitor 20 and controller 21 can be dispensed with.

The fully printed cards from the alphanumeric printer 19 are then supplied after separating from their 25 continuous roll to a film encapsulation unit 22 which

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applies transparent plastics film to both sides of the card and heat-seals the film around the edges of the card. The film is typically a laminate comprising a relatively high-melting point plastics, such as polyester as an outer layer 5 and a thermoplastic plastics such as polyethylene as an inner layer enabling the two layers to be bonded around the edge of the card and also firmly bonded to the surfaces of the card. As has been explained previously, the thermoplastics layer not only bonds to the paper surface of the 10 card, but also becomes bonded firmly to the toner and ink layers used for the various printing operations.

Preferably the stock paper fed initially to the graphic printer 18 is already treated to provide various security functions. For example, the paper usually has a 15 security print covering. It has been found that this security printing of the paper also becomes firmly bonded to the thermoplastics-encapsulating layer so that it becomes impossible to tamper with the graphic and alphanumeric data printed on the card over the security 20 printing without removing or destroying the security print.

In some applications, the card production facility may not be located with the data entry and computer storage apparatus. It is a relatively straight-forward matter to link the computing apparatus 14 via a modem 23 and over 25 telephone lines with a remote card production facility.



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Referring now to FIGURE 2, an example in cross-section of a complete security card, such as produced by the apparatus of FIGURE 1 is illustrated. The card employs a paper base 30. The paper base may include itself various security features such as a watermark. A security print 31 is then provided on at least one face of the paper base 30. Various security print designs may be used for this purpose. The graphic image and the alphanumeric data is then printed over the security print in layer 32. It will be appreciated that the layer 31 comprises the ink of the security print and the layer 32 comprises the ink and/or toner of the facsimile-printed graphic image and the alphanumeric printed data. The printed card is then encapsulated on both sides between plastics films 33 formed of a laminate comprising an outer polyester layer 34 and an inner polyethylene layer 35. Polyethylene layer 35 is thermoplastic so that the protective films can be heat-bonded firmly to the surfaces of the card and also around the edges of the card to each other. The outer polyester layer 34 provides a relatively durable skin to the finished article. It has been discovered that the thermoplastic layer 35 of the protective film bonds not only to the exposed surface of the paper base 30 but also makes a very firm bond to the exposed ink and toner layers 32 and 31. In fact, the thermoplastic material effectively perm- eates the ink and toner layers 32 and 31 during the heat-

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sealing process. It can be seen, therefore, that the resultant card is highly resistant to forgery or tampering. Even if the card is separated between the front and the back of the card, i.e. by splitting along the thickness of 5 the paper 30, access can only be gained to the facsimile-printed layer 32 by dissolving or destroying the security-printed layer 31. Thus, tampering with the layer 32 should be immediately evident.

FIGURE 3 illustrates another example of security card 10 incorporating further security features. The paper base is provided with an additional layer 36 underneath the security-printed layer 31. The additional layer may comprise a micro-tint background which is invisible to the naked eye but can be viewed under ultraviolet light.

15 Also, the inner face of the encapsulating film 33 may be printed with a layer 37 before application to the card. The layer 37 may also comprise a phosphorescent or fluorescent pattern visible under ultraviolet light.

Referring again to the block diagram of FIGURE 1, an 20 example of a suitable system employs a T. V. camera in which the video signal is digitised to provide 512 x 512 pixels each having a 6-bit code identifying one of up to sixty-four grey levels for the cell. Instead of a T.V. camera 12, the data defining the desired graphic image may 25 be produced by other techniques, e.g. laser scanning.

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The graphic printer 18 may be constituted by a facsimile printer which operates using electrically-sensitised paper which can be electrostatically charged to pick up toner in accordance with the desired image to be printed.

5 The toner is then heat-treated to form the printed image. Alternatively, on-line xerographic techniques can be employed which can print the desired image on to plain paper.

The alphanumeric printer 19 can conveniently be a daisy-wheel printer of one of the types currently available  
10 from various manufacturers.



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CLAIMS:

1. A method of making a security card bearing a graphic image which is characteristic of the card-holder together with alphanumeric data relating to the holder and the nature and/or usage of the card, comprising applying 5 said graphic image to said card by facsimile printing on to the card and applying said alphanumeric data to said card by printing in a predetermined type-face on to the card.
2. A method as claimed in claim 1, wherein a 10 sample reproduction or an original of said graphic image is recorded and digitised for storage in a computer store, said digitised signal being fed to a facsimile printer for printing said image on the security card.
- 15 3. A method as claimed in claim 1 or claim 2, wherein said alphanumeric data is keyed into a computer store in digital format for subsequent feeding to an on-line printer for printing on to said card.
- 20 4. A method as claimed in claim 3, wherein said alphanumeric data is printed on to the card in machine readable characters.



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5. A method as claimed in any preceding claim,  
wherein the card includes one or more security features,

6. A method as claimed in claim 5, wherein the  
5 card has a preprinted security design.

7. A method as claimed in claim 2, wherein a  
security over-print is added digitally to the image by the  
computer prior to facsimile printing the over-printed image  
10 on the card.

8. A method as claimed in any preceding claim,  
wherein the fully-printed security card is encapsulated  
between thermoplastic layers of transparent film so that  
15 the ink or toner layer of the facsimile-printed image,  
together with any other ink-printed layers on the card  
become bonded into the thermoplastic film covering.

9. Apparatus for making a security card hearing a  
20 graphic image which is characteristic of the card-holder  
together with alphanumeric data relating to the holder and  
the nature and/or usage of the card, the apparatus com-  
prising digital computer means including a computer store,  
means for supplying digital data defining said graphic  
25 image to the computer for storage, means for supplying

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digital data defining said alphanumeric data to the computer for storage, a facsimile printer responsive to said image-defining data from the computer to print said image on to said card, and an on-line printer having a predetermined 5 type-face responsive to said alphanumeric defining digital data from the computer to print said alphanumeric data on the same card.

10. Apparatus as claimed in claim 9 and including a 10 video camera and means for digitising the video signal therefrom for feeding to the computer means.

11. Apparatus as claimed in claim 9 or claim 10 and including an encapsulating and sealing machine for 15 encapsulating and sealing the fully-printed security card between thermoplastic transparent layers of film and bonding the film to the ink or toner layer of the facsimile-printed image and any other ink-printed layers on the card.

20 12. A security card comprising a card base having a graphic image facsimile printed thereon which is characteristic of the card-holder and also alphanumeric data printed thereon in a predetermined type-face, said alphanumeric data relating to the holder and the nature and/or usage of the 25 card.

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13. A security card as claimed in claim 12 further having one or more security features.

14. A security card as claimed in claim 13 having 5 a preprinted security design.

15. A security card as claimed in any of claims 12 to 14 wherein the alphanumeric data is printed in machine-readable characters.

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16. A security card as claimed in any of claims 12 to 15 and including layers of thermoplastic transparent film between which the fully-printed card is encapsulated and heat-sealed to bond the film to the ink or toner layer of 15 the facsimile-printed image and any other ink-printed layers on the card.

17. A security card as claimed in claim 16 wherein the film is a laminate comprising an inner polyethylene 20 layer and an outer polyester layer.

18. A method of making a security card substantially as hereinbefore described with reference to the accompanying drawings.

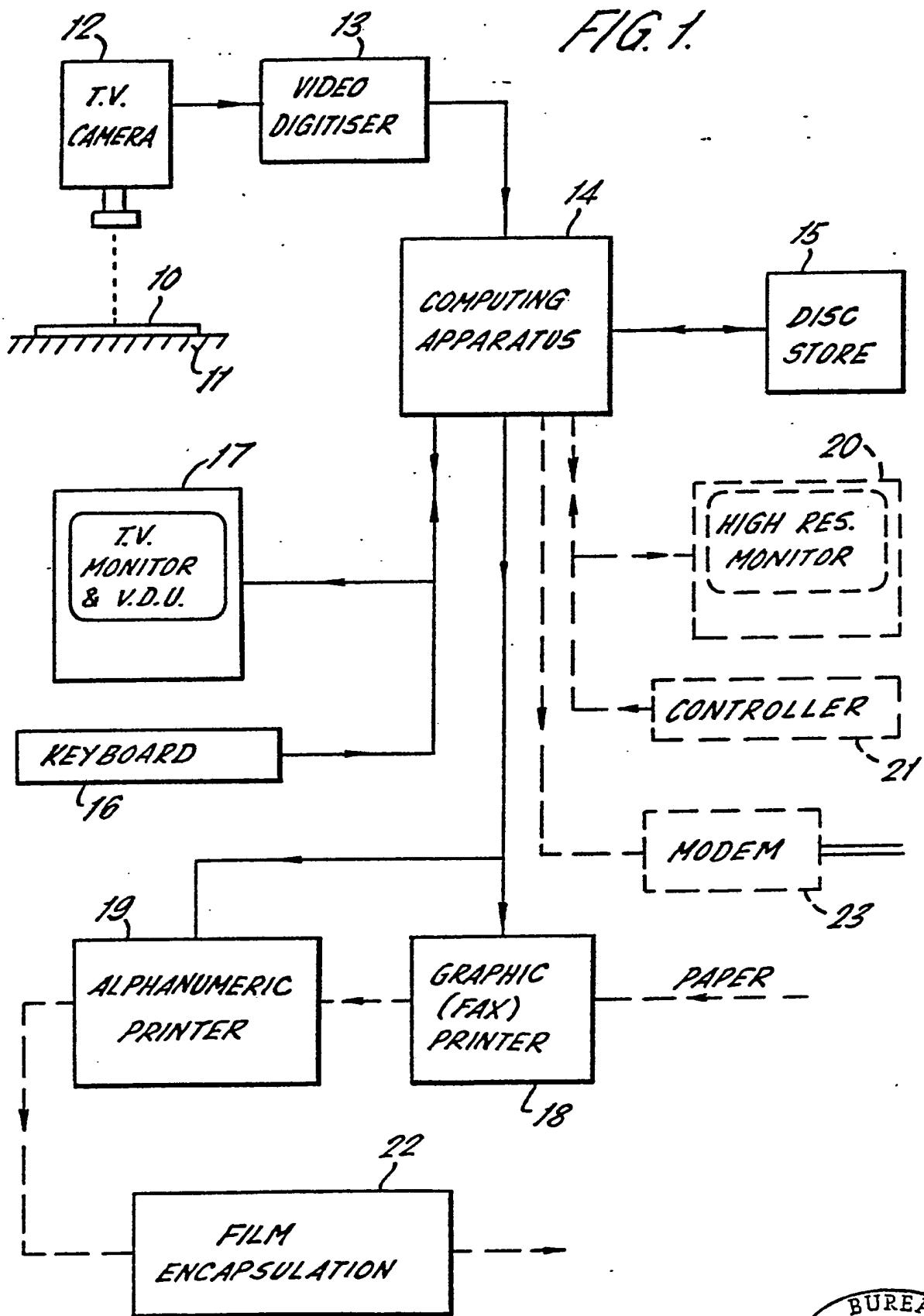
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FIG. 1.



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FIG. 2.

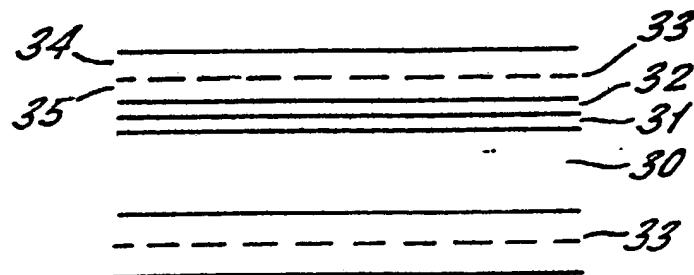


FIG. 3.

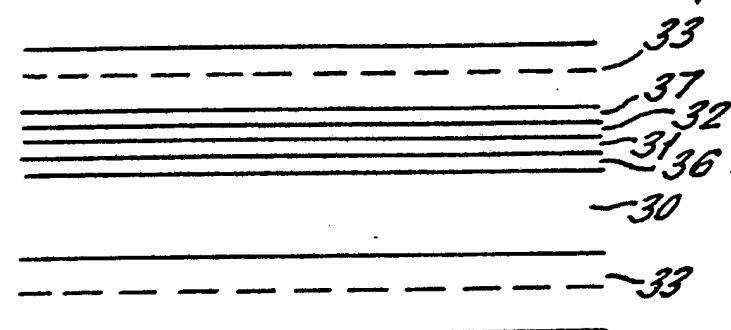
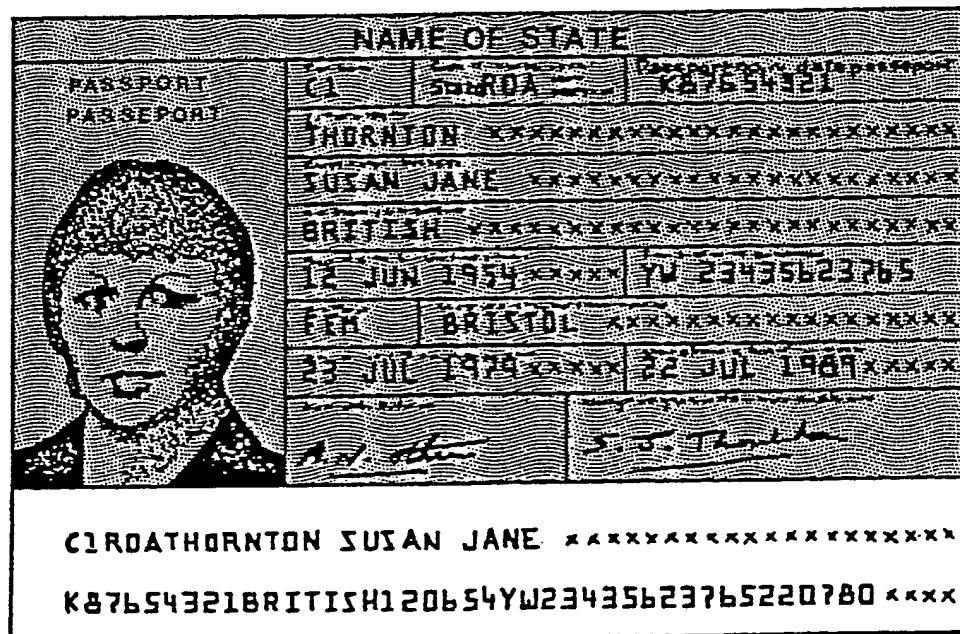


FIG. 4.



# INTERNATIONAL SEARCH REPORT

International Application No. PCT/GB 82/00150

## I. CLASSIFICATION OF SUBJECT MATTER (If several classification symbols apply, indicate all) <sup>3</sup>

According to International Patent Classification (IPC) or to both National Classification and IPC

IPC<sup>3</sup>: G 06 K 19/08; B 42 D 15/02

## II. FIELDS SEARCHED

Minimum Documentation Searched <sup>4</sup>

Classification System	Classification Symbols
IPC <sup>3</sup>	G 06 K 19/08; B 42 D 15/02

Documentation Searched other than Minimum Documentation  
to the Extent that such Documents are Included in the Fields Searched <sup>5</sup>

## III. DOCUMENTS CONSIDERED TO BE RELEVANT <sup>14</sup>

Category <sup>6</sup>	Citation of Document, <sup>15</sup> with indication, where appropriate, of the relevant passages <sup>17</sup>	Relevant to Claim No. <sup>18</sup>
Y	FR, A, 2305806 (MILOVANOVICH) 22 October 1976 see the entire document	1-6, 9-10, 12-15
Y	LU, A, 81049 (ROOTH) 19 June 1979 see figures 1,2; page 3, last paragraph - page 5, paragraph 3	1, 8, 11-12, 16
Y	DE, A, 2940891 (LIE, LOEK-KIT) 16 April 1981 see the entire document	1, 5-6, 12-14
Y	FR, A, 2321159 (AMERICAN BANK NOTE COMPANY) 11 March 1977 see figures 1,2; page 2, line 19 - page 3, line 38	6
A	EP, A, 0012374 (MORAW et al.) 25 June 1980 see figures 1-3; page 6, line 19 - page 8, line 11	1, 5, 8, 11, 12 13, 16
A, P	EP, A1, 0029988 (HELD et al.) 10 June 1981 -----	1

\* Special categories of cited documents: <sup>15</sup>

- "A" document defining the general state of the art which is not considered to be of particular relevance
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## IV. CERTIFICATION

Date of the Actual Completion of the International Search <sup>3</sup>

30th August 1982

Date of Mailing of this International Search Report <sup>3</sup>

14th September 1982

International Searching Authority <sup>1</sup>

EUROPEAN PATENT OFFICE

Signature of Authorized Officer <sup>2a</sup>

G.L.M. Koldenberg